

What is claimed is:

1. An electrical device comprising
 - (A) an element which
 - (1) has first and second surfaces and
 - (2) comprises a conductive polymer composition, and
 - (B) a first metal foil electrode which
 - (1) comprises
 - (a) a first surface having (i) a center line average roughness R_a μm , and (ii) a reflection density RD, the product R_a times RD being 0.5 to 1.6 μm , and
 - (b) a second surface, and
 - (2) is positioned so that the first surface of the electrode is in contact with the conductive polymer element.
 2. A device according to claim 1 wherein R_a is 0.5 to 2.7 μm and RD is at least 0.5.
 3. A device according to claim 1 wherein the conductive polymer composition comprises a polymeric component and dispersed therein a particulate conductive filler.
 4. A device according to claim 3 wherein the polymeric component of the composition comprises a polyolefin or a fluoropolymer.
 5. A device according to claim 1 wherein the conductive polymer composition exhibits PTC behavior.
 6. A device according to claim 1 wherein the first metal foil electrode comprises nickel or copper.

7. A device according to claim 1, wherein the first surface of the first metal foil electrode comprises nickel.

8. A device according to claim 1, further comprising a second metal foil electrode positioned so that the conductive polymer element is sandwiched between the first metal foil electrode and the second metal foil electrode.

9. A device according to claim 1 wherein the device is a circuit protection device which has a resistance of at most 100 ohms.

10. An electrical device comprising

(A) an element comprising a conductive polymer composition, and

(B) a first metal foil electrode which

(1) is produced by

(a) providing a base metal foil having a first surface having a center line average roughness R_a of at most 0.45 μm , and

(b) depositing material to provide protrusions onto the first surface of the base metal foil,

(2) comprises

(a) a first surface having (i) a center line average roughness R_a μm , and (ii) a reflection density RD, the product R_a times RD being at least 0.14 μm , and

(b) a second surface, and

(3) is positioned so that the first surface of the electrode is in contact with the conductive polymer element.

11. An electrical device comprising

(A) an element comprising a conductive polymer composition,

- (B) a first metal foil electrode which comprises
 - (1) a first surface which is attached to the conductive polymer element and has
 - (a) a center line average roughness R_a μm , and
 - (b) a reflection density RD, the product R_a times RD being at least $0.14 \mu\text{m}$, and
 - (2) a second surface, and
- (C) a crosslinking agent positioned between the first electrode and the conductive polymer element.

12. A device according to claim 11, wherein the conductive polymer composition exhibits PTC behavior.

13. A device according to claim 11, wherein the crosslinking agent comprises dicumyl peroxide.

14. A process for making an electrical device, said process comprising

- (A) providing an element comprising a conductive polymer composition,
- (B) providing a first metal electrode having
 - (1) a first surface having a center line average roughness R_a and a reflection density RD such that the product R_a times RD is at least $0.14 \mu\text{m}$, and
 - (2) a second surface,
- (C) positioning at least one crosslinking agent between the conductive polymer and the first surface of the first metal electrode, and

(D) securing the first surface of the metal electrode to the conductive polymer element with the crosslinking agent therebetween.

15. A process according to claim 14 wherein the crosslinking agent is activated concurrently with the securing process.

16. A process according to claim 14 wherein the crosslinking agent is activated by thermal or radiation means.

17. An electrical device comprising

(A) an element comprising a conductive polymer composition and

(B) in contact with the element, a metal electrode comprising

(1) a base metal foil and

(2) first and second surfaces, said first surface comprising

(a) protrusions having a maximum height of 1 μm and

(b) a reflection density RD of at least 0.6.

18. A device according to claim 17 wherein the metal electrode is produced by a process comprising

(A) providing a base metal foil having first and second surfaces, and

(B) pulse plating metal deposits onto at least the first surface of the foil using a pulse frequency of 10 to 1000 Hz.

19. A device as in claim 17, wherein the base metal foil comprises copper or nickel and the metal deposits comprise copper or nickel.

20. An electrical device comprising

(A) an element comprising a conductive polymer composition and

(B) a metal electrode, the metal electrode comprising

- (1) a base metal foil,
- (2) a first surface which
 - (a) comprises dendritic metal structures, and
 - (b) is in contact with the element, and
- (3) a second surface.

21. A device according to claim 20 wherein the metal electrode is produced by a process consisting essentially of

- (A) providing a base metal foil having a first surface and a second surface, and
- (B) depositing dendritic metal structures onto at least the first surface of the base metal foil by electrodepositing metal under diffusion limited conditions.

22. A device according to claim 20, wherein the base metal foil comprises copper or nickel and the metal dendrites comprise copper or nickel.

23. An electrical circuit which comprises

- (1) a source of electrical power;
- (2) a load; and
- (3) a circuit protection device according to claim 1 electrically connecting the source and the load.